RESET06 Expedition
R/V Atlantis/DSVII Alvin 15-6
Macrobiology Program Preliminary Summary and Highlights

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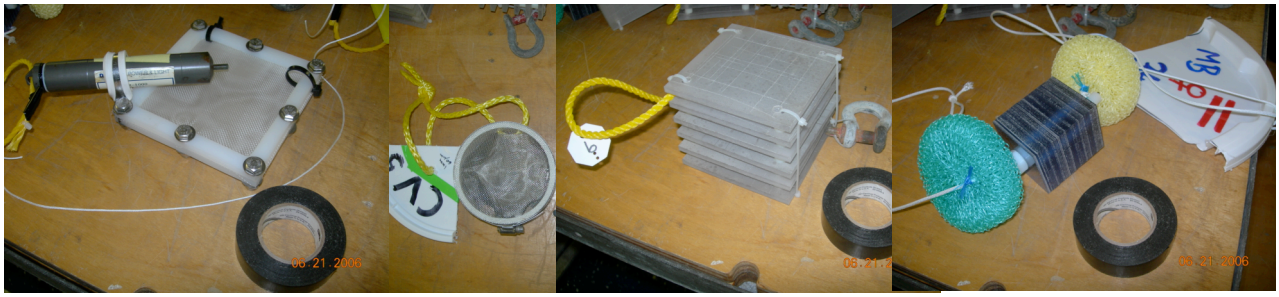
The macrobiological activities and objectives of this cruise were integrated into the fluid and *in situ* chemical, geological, and the microbiological dive activities.

Summary of Activities

Objective 1. Deployment of microbial and metazoan colonization surfaces
The deployment of substrates in areas of active diffuse venting following the eruption was important to initiate studies to examine the linkages among microbial colonization, fluid chemistry, and faunal colonization. In order to collect and identify early colonizers following the 2006 eruption for a variety of future co-located ecological studies, we deployed 12 mesh substrates with self-recording Vemco temperature probes, referred to as TAMS (Temporal Autonomous Multi-disciplinary Substrates) in the Marker 8 (referred to as "TamTown") area, three round stainless steel mesh arrays ("Rounds") for microbial colonization (C. Vetriani), three and three plastic "Sandwich substrates" (L. Mullineaux) in the Bio9 and Marker 8 areas, respectively; and three plastic "Baby traps/sponges" (M. Bright) in the Marker 8 area. All of these substrates (see images below) were deployed either in or adjacent to diffuse venting areas. A short-term (4 day deployment) of two ARCO microbial traps were also deployed in the Marker 8 area to collect microbes associated with the flocculent expulsion of microbes associated with post-eruptive "snow-blower" type venting.



TAMS ROUNDS SANDWICH BABY-TRAPS

Objective 2. Linking microbial and faunal colonization and *in situ* habitat chemistry

Seafloor eruptions provide a unique opportunity to look at the evolution of habitat fluid chemistry and microbial and faunal colonization. In order to document the changes in microbial and faunal colonization with habitat fluid chemistry over time, co-located *in situ* electro-chemistry measurements and colonization studies were initiated to assess diffuse-flow habitat conditions and establish a baseline for future investigations of how these habitats develop chemically and biologically over time. The deployment of several of the substrates listed above as well as the collection of natural diffuse flow habitats where active colonization was occurring were coupled with *in situ* autonomous chemical measurements using the DLK electrochemical wand mounted on Alvin. See the Electrochemistry section of this report for a more complete description. In brief, short-term sampling *in situ* fluid chemistry where Sandwiches were deployed on dive 4206 near "Bio9" and where TAMS were deployed on Dive 4207 at Marker 8 were characterized with electrochemical and temperature measurements.

Longer-term sampling of *in situ* chemistry and coincident correlation with the development of post-eruptive communities was initiated using an autonomous *in situ* sensor, known as the IN situ Electrochemical Analyzer (ISEA or INSECT). This instrument (see Electrochemistry section) was deployed via an "elevator" for a 6-month duration, to be recovered in January 2007. Four working electrodes outfitted with Vemco temperature loggers were placed in two "natural" diffuse flow areas where colonization by "*Tevnia"* was evident as well as positioned adjacent to the mesh of two "non-natural" TAMS colonization substrates.

Objective 3. Larval/sediment Trap Mooring Recovery and Redeployment

To collect hydrothermal particulates and larvae to investigate the evolution of vent plume geochemistry and to quantify larval flux and temporal genetics of larvae, two sediment trap moorings (one with a RCM11 current meter) were deployed during the New Horizon 2006 response cruise were recovered on June 25 and 26 and redeployed on June 29. Each of the sediment traps cycled through the 21 collection cups successfully. Shipboard preliminary assessment (visual observation) of the collected material revealed cups containing flocculent/fuzzy "microbial" material, dark particulates and also crab (megalope) larvae. For the redepoyment, the cups will rotate every 6 days, and the moorings will be recovered in October 2006.

Objectivc 4. Characterization of Early Colonization

In order to identify the processes of initial faunal colonization, the distribution of initial and early colonists, the interaction of microbial communities and faunal settlement, and the subsequent development of biological communities, we collected basalt pieces from diffuse-flow likely to host early colonists (metazoan and microbiological). We imaged and examined the basalt under the microscope (and preserved for future microscopic, genetic, and ecological analyses). Both macro- and meiofaunal size fractions were preserved to provide detailed study of early succession in diffuse-flow habitats.

Objective 5. Establishment of Transect Areas

The establishment of a transect area using seafloor markers was one our biological goals. In the past these markers have been integral to guiding our biological and chemical studies and have

provided a great efficiency on the seafloor for sub operations, facilitating our ability to quickly locate experiments and sampling locations and provide infrastructure for all disciplines in addition to our specific biological goals. We intended to mark study areas and leave them "undisturbed" in order to examine the "natural" changes in communities for comparison with patterns observed following the 1991 eruption and for comparison to "disturbed" areas in this and other habitats. This goal was not accomplished, because the strategy for deploying markers was altered prior to the dive program as well as unforeseen difficulties with the operation of the marker deployer devices.

Objective 6. Trophic Studies of Post-Eruption Colonists

In order to examine temporal changes in trophic interactions (through stable isotope and gut content analysis), we deployed a crab trap on Dive 4203 at the Marker 8 area to collect mobile predator and scavengers. While brachyuran crabs were abundant in this area, neither crabs (and nor any other fauna) were collected in the trap after 4 days on the bottom.

Objective 7. Locating and Sampling Pre-Eruption Communities

In order to identify potential and available source populations for new colonizers in nascent diffuse flow areas, one of our goals was to locate and sample extant or pre-existing (pre-eruption) vent communities. With the possible exception of high-temperature chimney-associated fauna on chimneys that did and may have preceded the eruption, no confirmed pre-existing communities were observed (see below). This objective was not successfully accomplished.

Macrofaunal Results and Highlights

• **Habitat Setting**
The 1991 eruption resulted in the formation of a well-defined primary eruptive fissure through which the majority of the macrobiological communities between 9°50.3 and 9°49.6'N were situated. The majority of venting habitats observed after the 2006 eruption are supported by hydrothermal activity through broken sheet flow and collapse talus (e.g., ~9°50.33'N and 9°49.9'N).

• **Diffuse Flow Communities**
Nascent diffuse flow communities in fluids up to 30°C consisted of *Tevnia jerichonana* (and perhaps other unidentifiable vestimentiferans) of variable size (none more than ~ 4 cm individual length were sampled or apparently observed), *Paralvinella pandorae*, polynoids, the limpets *Ctenopelta porifera* and *Peltospira operculata*. Observations of individual *Tevnia* were observed on the exposed surfaces of the basalt *in situ* as well as on the sides and bottom surfaces of collected basalt rocks. In general, *Tevnia* colonized basalt surfaces bathed in fluid flow with the greatest abundance photo-documented at the Marker 8 area. Recovered *T. jerichonana* ranged in size from 1mm to < 4 cm). *Paralvinella pandorae* and *Ctenopelta* were also prevalent with *T. jerichonana* in diffuse-flow areas.

• **Extant Communities**

While two disarticulated mussel shells were observed in the old Biomarker #82 area and empty *Riftia* tubes were observed on the western side of the axial trough, no confirmed extant communities were located during the course of the dive or fiber-optic programs. No systematic search was conducted at the BioVent, Mussel Bed, East Wall, Tica, or south of the old Biomarker #82 area within the BioGeoTransect. A and L Vents (~9°46.5'W) were visited and alvinellid communities were present on L Vent. *Tevnia jerichonana* colonists were observed and sampled around eruptive lava at the base of L Vent. Empty *Riftia* tubes were clumped and scattered up to 200 m outside the western walls of the AST. A single ~0.75m live *Riftia* was observed on basalt at the base of P Vent. No live *Riftia* colonists were confirmed.

• **Chimney-Associated Communities**
Alvinellid communities, including *Alvinella pompejana, Alvinella caudata*, copepods, polynoids (i.e., *Lepidonotopodium fimbriatum*), *Paralvinella grasslei*, *Hessiolyra bergi*, *Hesiopina vestimentifera*, and *Nodopelta* limpets were collected in high-temperature sulfide habitats, including "Q Vent", "P Vent", "L Vent" and high-temperature venting structures were sampled north of new Marker #8. Three mussels (*Bathymodiolus thermophilus*) were recovered from seemingly inactive sulfide structure from A Vent).

• **Composition and distribution of mobile fauna**
Small brachyuran crabs (~ 2 cm; much less than commonly observed) were highly abundant in the 9°50.3, 9°49.9, and 9°46'N areas. Zoarcid fish (in a range of sizes) were more abundant than bythidids, although bythidids were abundant as aggregations in "fish holes" at the base of Q Vent. The shrimp *Alvinocaris lusca* was highly abundant in areas near actively venting areas, but not observed directly in diffuse flow. Amphipods (Halice sp.) were observed in swarms above diffuse venting through lava remnants and between lobate lavas. Swarms were not observed above rigorous diffuse flow.